

Code Literacy Curriculum

Puzzle Adventure Video Game

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*Developed by Cameron L Fadjo as part of research conducted with
the Institute for Learning Technologies at*

TEACHERS COLLEGE
COLUMBIA UNIVERSITY

Name: _____ Grade: _____ Date: _____

Puzzle Adventure Video Game (PAVG) Storyboard

You are going to make a video game. In your game, the main character needs to collect three missing objects in a short amount of time. You are going to create a title, describe the main character, choose a background, select three objects the character needs to find, and determine how much time the main character has to find the missing objects.

Title: _____

Describe the main character in your game:

Name: _____ Age: _____



Boy



Girl

Gender (*Circle One*):

Choose a Background (*Circle One*):

Outdoors



Indoors



Which three items are missing? (*Circle Three*):

bananas	baseball	basketball	beachball	cheesy-puffs	drum	flower-vase
fire-hydrant	fortune-cookie	fruit-platter	hair	key	lamp	laptop
lego	marble-building	mic	partyhat	rock	scoreboard	soccerball
sunglasses	tennis ball	trampoline	umbrella	wizardhat		

How much time does the main character have to find the missing objects? (*Circle One*):

15 Seconds

30 Seconds

45 Seconds

One Minute

PAVG Code Literacy Curriculum

Day One

Launching the program

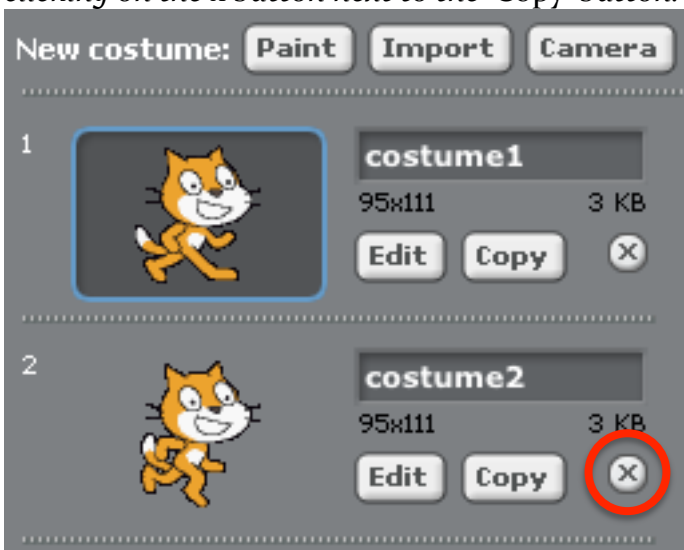
- 1) Have the students open Scratch by launching the program from the Start menu (Windows) or from within the Applications folder (Mac).

Using the PAVG Storyboard, have the students update their Scratch project with the character selected as the main character.

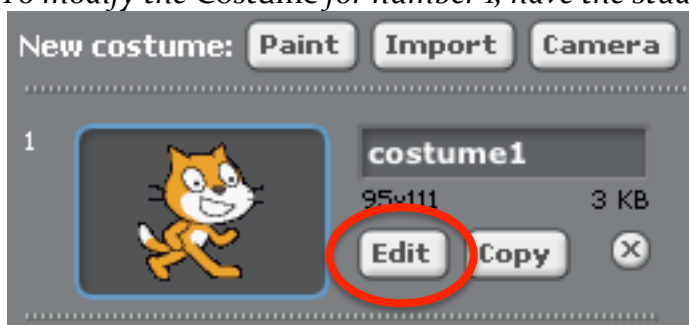
- 2) To start, have the students select the **Costumes** tab for Spriter:



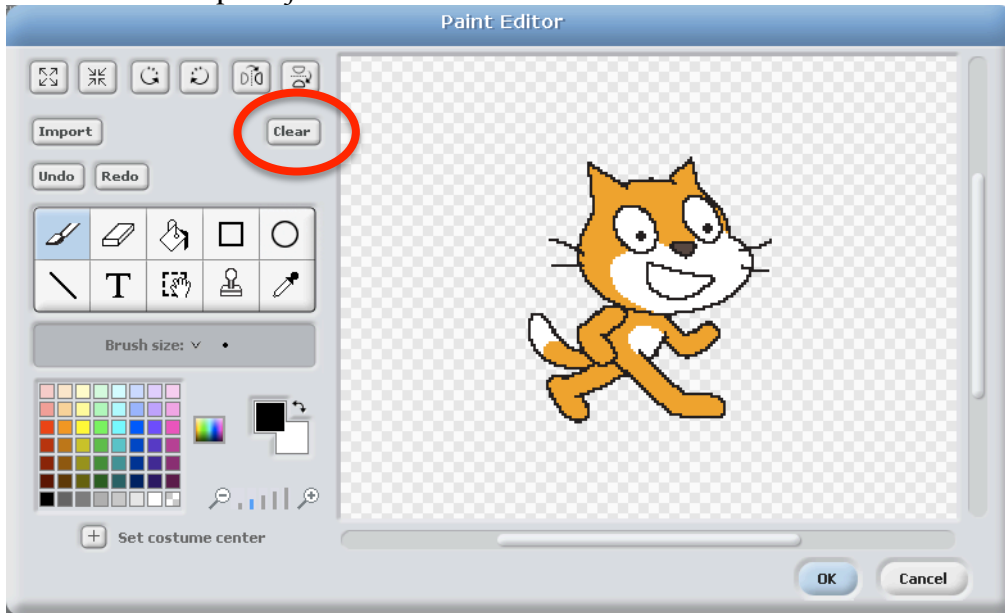
- 3) Within this tab there are two Costumes. Have the students delete the second Costume by clicking on the x button next to the 'Copy' button.



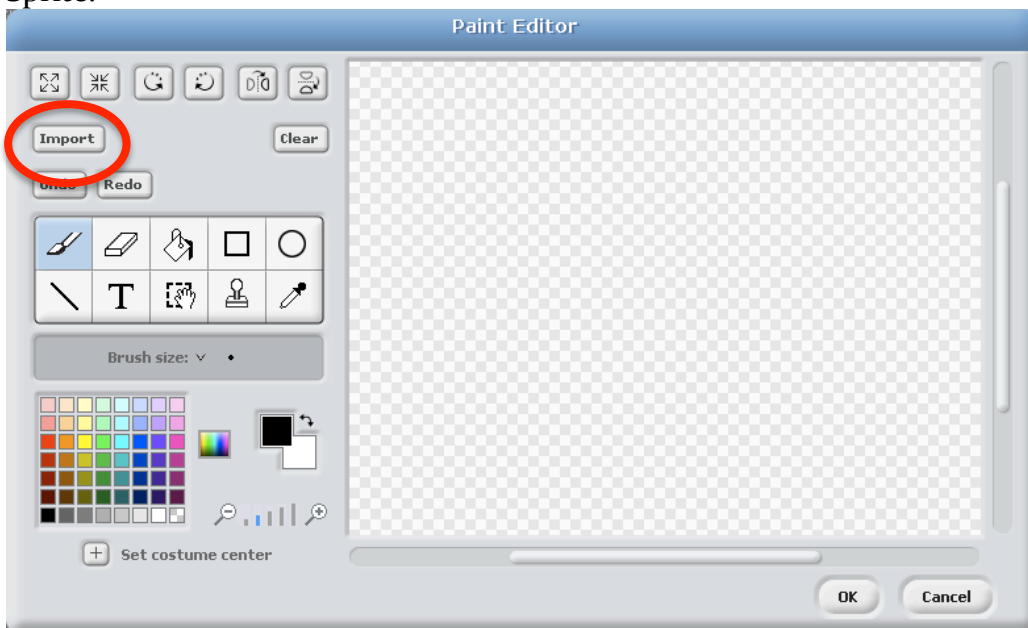
- 4) To modify the Costume for number 1, have the students click on the Edit button.



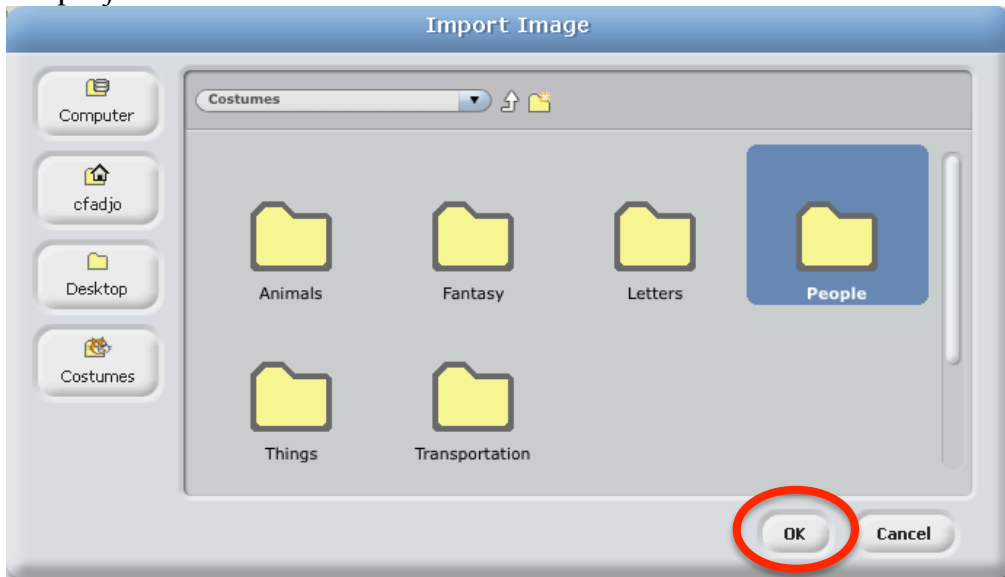
- 5) A Paint Editor window will appear. In this window, have the students click the Clear button to remove the Sprite from the Canvas.



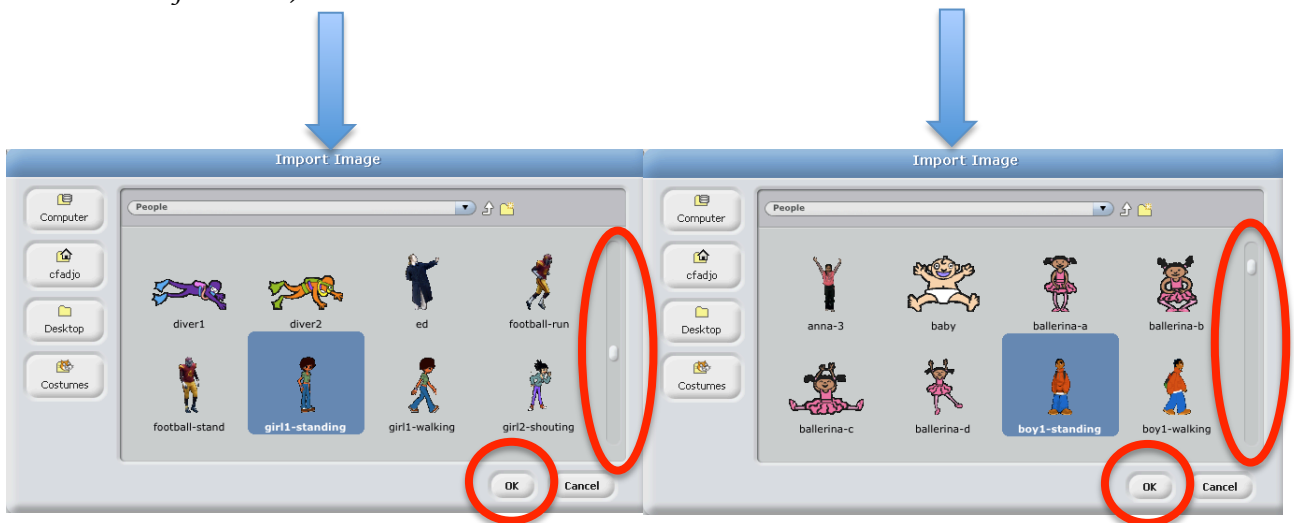
- 6) Next, the student will click on the Import button to select correct the Costume for the Sprite.



- 7) When the Import Image window appears, have the students either select the People folder with both a single-click and click OK to open the folder or have them double-click on the People folder.



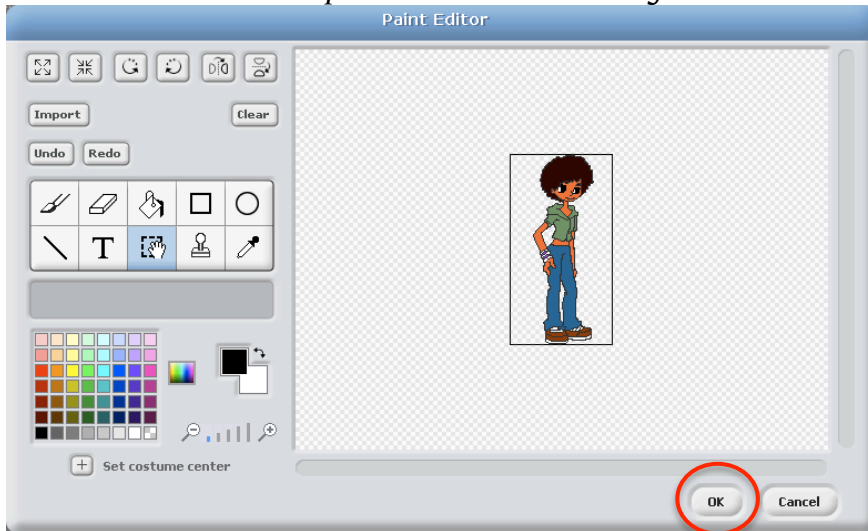
- 8) Once inside the People folder, have the students scroll down to the appropriate image, either the Boy or Girl from the PAVG Storyboard. Have the students select the image by both single clicking and clicking the OK button or by double-clicking (either operation will do the same function).



GIRL

BOY

- 9) Now that the correct Costume has been selected, have the student click the OK button in the Paint Editor to complete the Costume change.



Next, we're going to replace the default text for Sprite1 with the name of the main character written on the PAVG Storyboard.

- 10) Above the Costumes tab, highlight the text within the text field (most likely it will say 'Sprite1')



- 11) Have the students change the text in the field to the name written for the main character on the PAVG Storyboard.



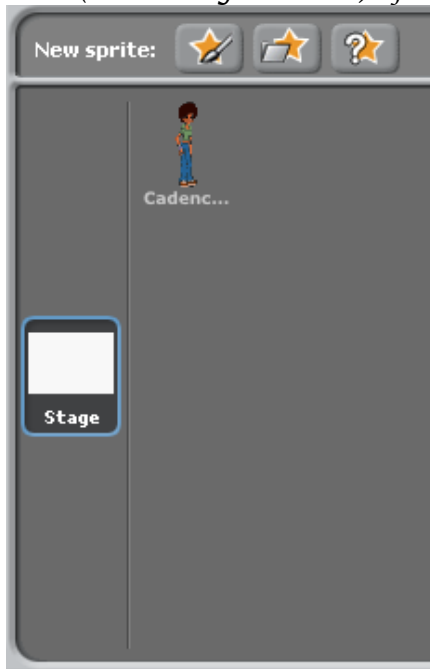
Before moving on to modifying the Background image we want to set the Sprite rotation setting.

- 12) Have the students select the middle button to the left of the small Costume image.

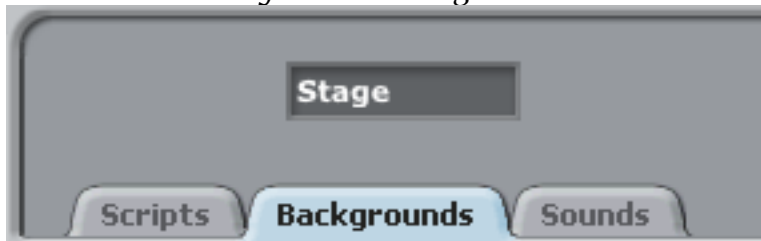


Now that we have the main character of the game set, we want to modify the Background to reflect the choices made by the student in the PAVG Storyboard.

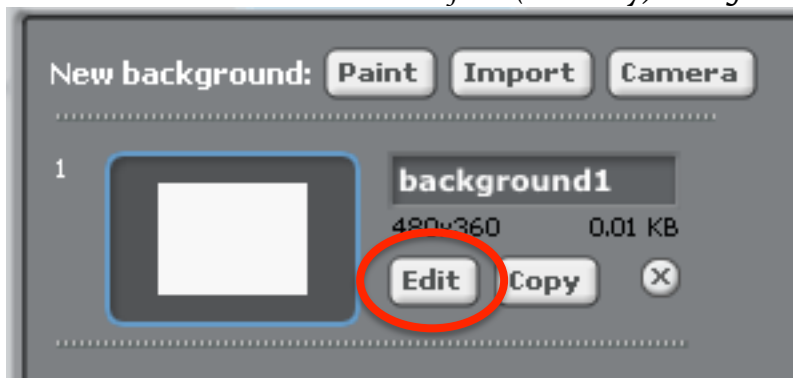
- 13) To modify the Background image, have the students click on the Stage icon in the Sprite Area (bottom right corner) of the window



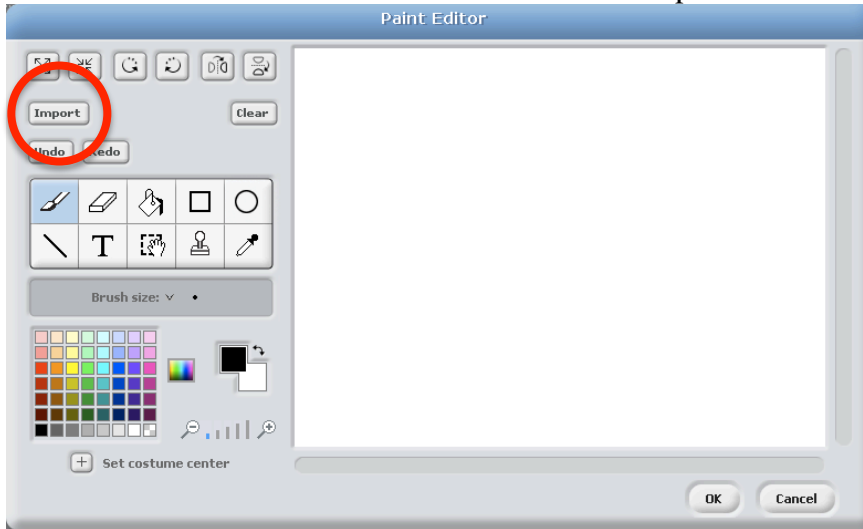
- 14) Have the students go to the Backgrounds tab in the middle of the window



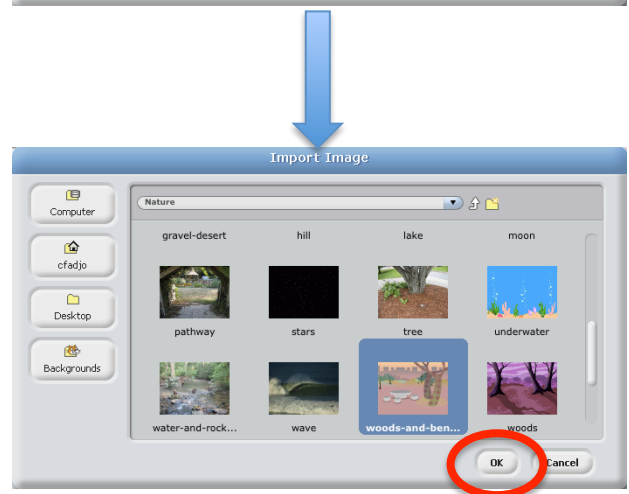
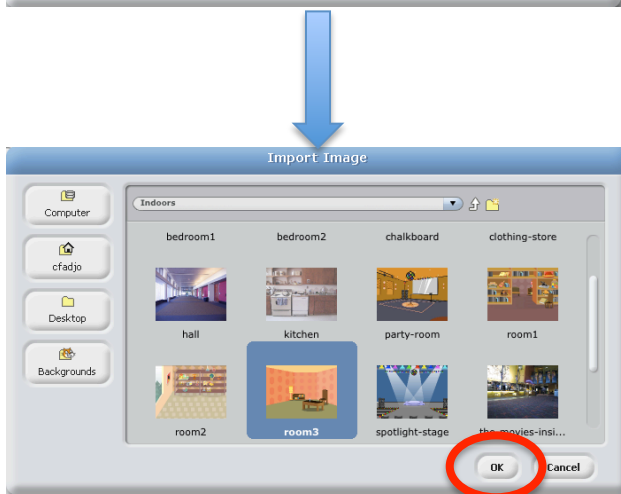
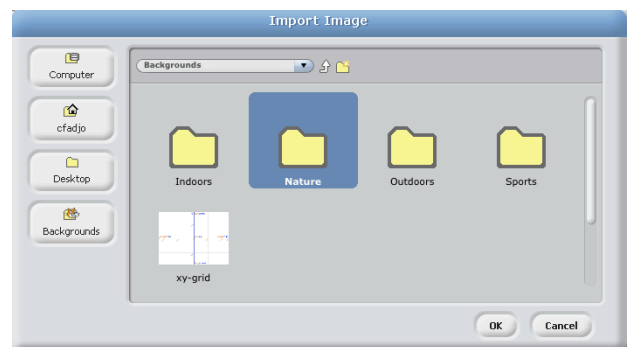
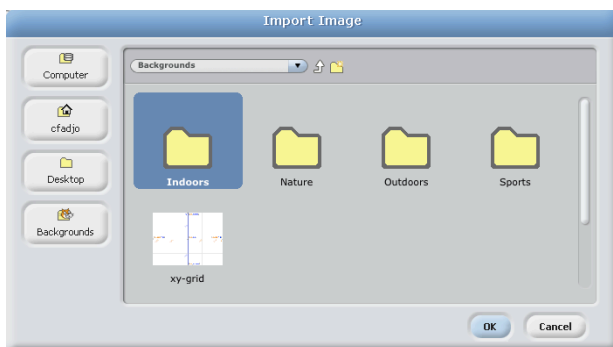
- 15) Click the Edit button next to the first (and only) background in the list.



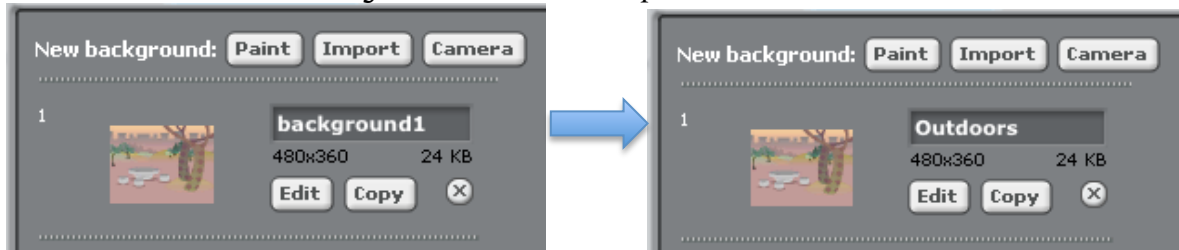
16) In the Paint Editor have the students click the Import button



17) Depending on the Background selected in the PAVG Storyboard, have the students either open the Indoors folder and select Room3 or open the Nature folder and select woods-and-bench. Have the students click OK in the Import Image and Paint Editor windows to place the correct Background onto the Canvas.



- 18) Next, we want to label the Costume with its corresponding title. To do this, have the students click on the 'background1' label and replace it with either 'Indoors' or 'Outdoors'



Now that the background and main character have been set, we're going to make the character move.

- 19) Have the students add the following Stacks to the Script for the main character:



- 20) When right arrow key pressed, change x by 10



- 21) When left arrow key pressed, change x by -10



- 22) When up arrow key pressed, change y by 10



- 23) Ask the students to 'guess' what the next script will be, then give them:
When down arrow key pressed, change y by -10



At the end of the first day, and each subsequent day, each student must follow a set of instructions on how to save their Scratch project file.

24) Have the students save their projects as FirstInitial LastName PAVG Day 1 after they have completed the proper saving instructions (see Scratch Project Save Sheet for detailed info).

- a. Reflection Prompts
 - i. *What did you do today?*
 - ii. *What actions can your Sprite do?*
- b. Project Code: PAVG
- c. Day Number: Day One

Day Two

Today we're going to have the students change visual effects of the game. To start, have the students add the following Stacks to the main character's Script:

25) When d key pressed, change fisheye effect by 25



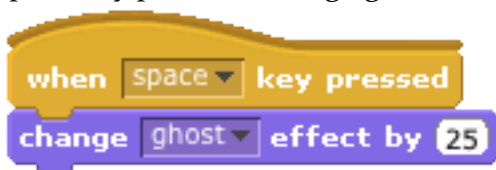
26) When f key pressed, change fisheye effect by -25



27) When c key pressed, clear graphic effects



28) When space key pressed, change ghost effect by 25



29) When g key pressed, change color effect by 25

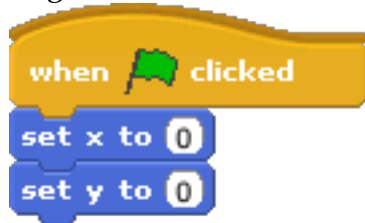


30) Do not show them the code. Have the students create the following script without a demonstration: When m key pressed, change whirl effect by 25



31) At this point, each student should have **ten** Stacks in his or her main character's Script. Ask the students to raise their hand if they do not have exactly ten Stacks. For those students that raise their hand, instruct them to consult with a neighbor to identify any missing Stacks in their main character's Script. Continue with instruction once all students indicate that all **ten** Stacks are in the Script area.

32) Have the students add the following Motion-related Stack to the main character's Script:
When 'flag' clicked, set x to 0, set y to 0



33) Next, have the students move the following two Blocks to the Stacks for the main character and ask the students to add the two individual pieces of code to two pre-existing Stacks: point in direction 90 (have them add this to the Stack from PAVG CLC step 19), and point in direction -90 (have them add this to the Stack from PAVG CLC step 20).



(for the right arrow key pressed script)



(for the left arrow key pressed script)

34) Ask the student to confirm that PAVG CLC step 33 (the previous instruction) results in the following Stack: When right arrow key pressed, point in direction -90, change x by -10.



35) Similarly, confirm that the Stack for the 'left arrow key pressed' event has been updated and contains the following Blocks: When right arrow key pressed, point in direction 90, change x by 10



- 36) *Have the students save their projects as FirstInitial LastName PAVG Day 2 after they have completed the proper saving instructions (see Scratch Project Save Sheet for detailed info).*
- a. Reflection Prompts
 - i. *What did you do today?*
 - ii. *What effect did adding the 'point in direction' Block to the main character's Script have on the character's movement?*
 - b. Project Code: PAVG
 - c. Day Number: Day Two

Day Three

37) **Classroom Activity:** Introduce the concept of a variable by using a physical cup, a piece of paper, and a label on the outside of the cup.

38) Provide the students with the following steps: Make a variable -> Variable name? -> Have them enter Score as the name and then have them press OK



Next, we want to create the Stack that will set the value of the Score variable, provide the player with some context for the game, and set the condition that will need to be met in order for the game to be successfully completed.

39) Have the students add the following Stack to the Script for the main character:
When 'flag' clicked, set Score to 0...



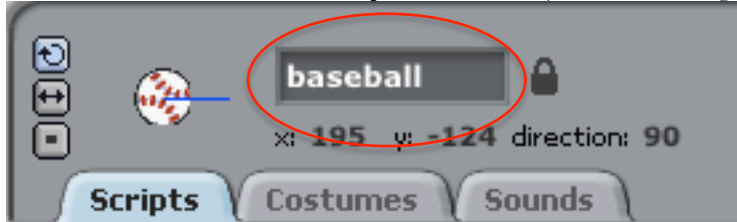
Now that the game has been set with the condition for finding the three objects, we have to first create the three objects in the project.

40) To start, the students are going to create three different Sprites. Using the PAVG Storyboard, have the students pick a new Sprite (second button -> folder with Star)



Once the window appears, have them go to the **Things** folder and double-click on the object that was selected as one of the three missing items on the Storyboard.

- 41) Have the students correctly label the object at the top of the screen:



- 42) Have the student repeat steps 39 and 40 to create the Sprites that will become the second and third missing objects (as selected in the PAVG Storyboard).

After the students have added all three missing objects to the game, have them return to the Script of the main character where we will add the Stacks that will respond to the Collisions that occur between the main character Sprite and the missing object Sprites.

- 43) Once the main character's Script tab has been selected, have the students create the following Stack for each missing object: When 'flag' clicked, wait until touching **nameOfObject**, change Score by 1, say 'I found my missing **x**' for 2 secs **where x is the actual name of the missing object**.



Once the first Stack for the collision with the missing object has been written, teach the students how to duplicate the Stack for the second and third objects.

- 44) To **duplicate**, right-click on the top-most Block in a Stack and select 'duplicate.' A copy of the Stack will appear below the mouse cursor. Have the students drag this Stack of Blocks to an open area in the Script. All three missing object Stacks are to be placed within the main character's Script.

45) Next, have the student update the two Stacks so that the newly created Stacks will respond to Collisions between the second and third missing object and the main character.

Object Two:



Object Three:



Debugging: If time permits, have the students play another student's game and answer the following questions in three to five sentences each (preferably in a Google Doc, personal wiki, or blog):

- A) What did you like about the game?
- B) What code would you add to make the program better?
- C) What features would you add to make the program better?

46) Have the students save their projects as FirstInitial LastName PAVG Day 3 after they have completed the proper saving instructions (see Scratch Project Save Sheet for detailed info).

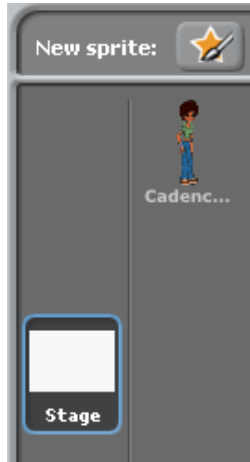
- a. Reflection Prompts
 - i. How many points will your character get after collecting all three objects?
 - ii. What did you do today?
- b. Project Code: PAVG
- c. Day Number: Day Three

Day Four

Now that we have created the Stacks that will respond to the Collisions between the main character and the missing objects, we're going to add a soundtrack to the game.

Please Note: It is highly recommended that students use headphones during this part of the game development process. Before having the students add sound to the game, test out the sound output settings on the computer through the Volume control at the top-right of the screen (Mac) or bottom-right of the screen (Windows).

- 47) Have the students click on the Stage icon in the Sprite Area (bottom right corner) of the window



Next, we want to **import** the sound that will be used for the soundtrack.

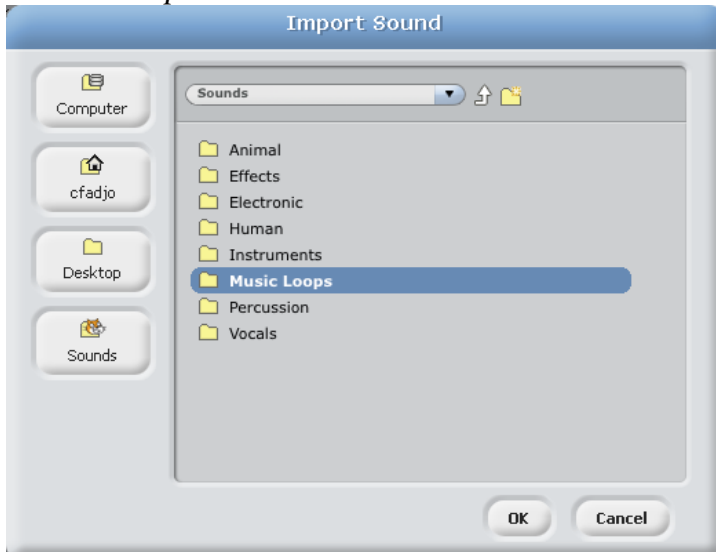
- 48) Have the students select the Sounds tab.



- 49) Click on the Import button. This will allow the student to choose the sound that will be used for the soundtrack.



- 50) In the Import Sound window, have the students single-click on the Music Loops folder and click the OK button. Similarly, the students can double-click on the Music Loops folder to select and open it.



- 51) Within this window the students are allowed to select a single sound file that will be used as the soundtrack for the game. To choose a particular sound file, double-click on the sound file title or single-click on the sound file title and then click OK.

Please Note: The sounds will begin to play once the student single-clicks on a title. Double-clicking will result in the selection of the sound file and it will automatically be added to the Sounds list.



- 52) Once the desired sound file has been selected, have the student click on the Scripts tab for the Background.



- 53) Have the students add the following Stack to the Script for the Background:
When 'flag' clicked, forever [play sound DripDrop or any other sound until done]



Module: At this point, if time permits, students are encouraged to pick one of the following modules to add to their project:

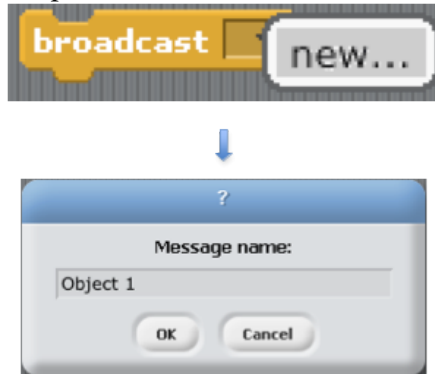
- Making Music: Create a drum beat
- Visual Effects: Flickering & Flashing Colors
- Visual Effects: Flashing Objects
- Visual Effects: Exploding & Shrinking Objects

- 54) Have the students save their projects as FirstInitial LastName PAVG Day 4 after they have completed the proper saving instructions (see Scratch Project Save Sheet for detailed info).

- a. Reflection Prompts:
 - i. What did you do today?
 - ii. Which module did you use and how did you use it in your project?
- b. Project Code: PAVG
- c. Day Number: Day Four

Day Five

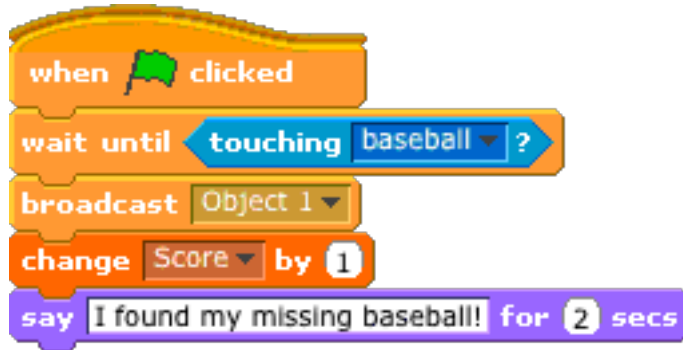
- 55) **Classroom Activity:** Introduce the concept of broadcasting by discussing the primary functionality of a Broadcast message. In particular, focus on how a Broadcast involves both a silent message being sent and the receiving of said silent message by one or more recipients. A mass email to a select group of friends for a party is an apt metaphor for the Broadcast concept.
- 56) Provide the students with the following steps for creating a Broadcast message: broadcast new... -> Message name? -> Have them enter Object 1 as the name of the message and then have them press OK.



- 57) Have the students select the Script for the main character. For this step, have the students update CLC PAVG steps 43 & 44 with the newly created Broadcast Block.



- 58) The Stack should now look like this:

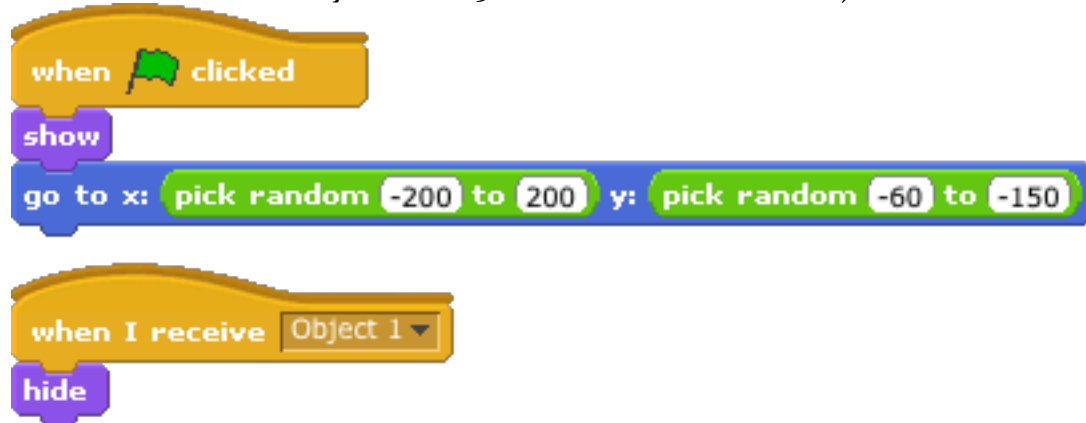


- 59) Have the students repeat PAVG CLC steps 56 and 57 for the Stacks created in PAVG CLC step 44. The two Stacks should now look like this:



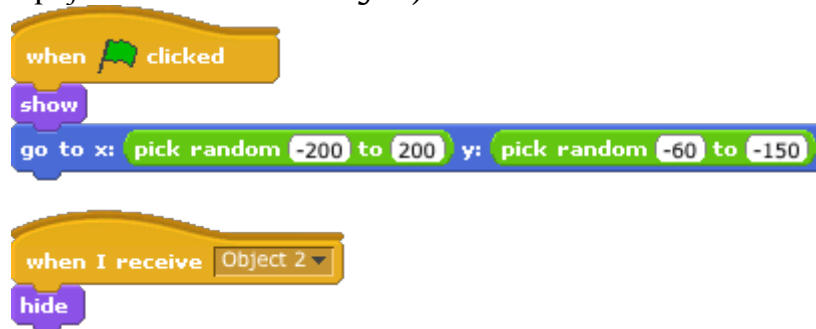
Now we need to update the individual missing objects so that they are randomly positioned on the Stage and that they appear when the game starts and disappear once a Collision occurs.

- 60) Have the student select the first missing object from the Sprite Area. Have the students add the following Stacks to the Script for the first missing object: when 'flag' clicked, show, go to x: pick random -200 to 200 y: -60 to -150 **and** When I receive Object 1, hide.

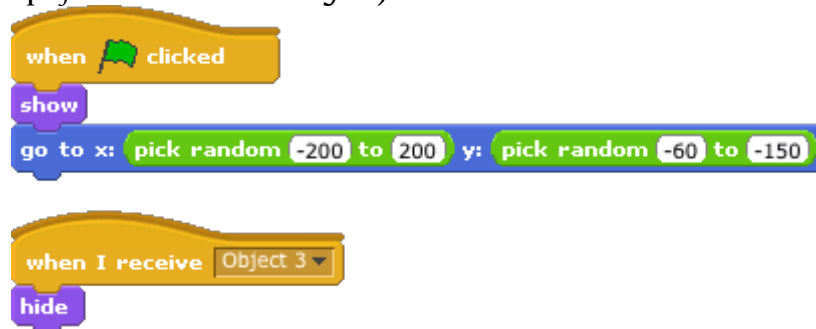


- 61) Have the students add the same two Stacks to the Scripts for the second and third missing object. The students will have to update the when I receive ... Block to correspond with the missing object. **Please Note:** The Stacks can be added to the Script for the second and third missing objects by clicking on the Hat Block for each Stack and dragging it to the Sprite icon in the Sprite Area for the second and third Sprites, respectively.

- 62) The Script for the second missing object should look like this:



- 63) The Script for the third missing object should look like this:



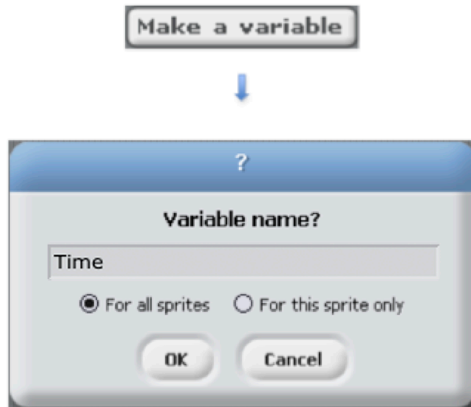
- 64) **Classroom Activity:** Have the students complete the Coordinate Grid Activity and place the final product in their individual folders.

- 65) *Have the students save their projects as FirstInitial LastName PAVG Day 5 after they have completed the proper saving instructions (see Scratch Project Save Sheet for detailed info).*
- a. Reflection Prompts
 - i. *What does the Broadcast Block do?*
 - ii. *Into which quadrants do the missing objects get placed?*
 - iii. *Which values would you enter into the 'go to' block to put the missing objects into quadrant II?*
 - b. Project Code: PAVG
 - c. Day Number: Day Five

Day Six

Next, we want to add a Time variable to the game.

- 66) To create a second 'container' to hold the value of the 'timer,' have the students create a second variable and call this one Time. Have the students go to the Variables Library and complete the following steps: Variable -> Make a variable -> Variable name? -> Have them enter Time as the name and then have them click the OK button.



- 67) Have the students then click on the Stage in the Sprite Area (bottom right corner of the Scratch screen).



- 68) Now that we have the Time variable created, we need to set the value of the Time variable to the value circled on the PAVG Storyboard. Have the students get their Storyboard. In the Script for the Stage, have the students add the following Blocks. Make sure the students understand that they need to enter the value of the Time variable as the one they circled on their Storyboard.

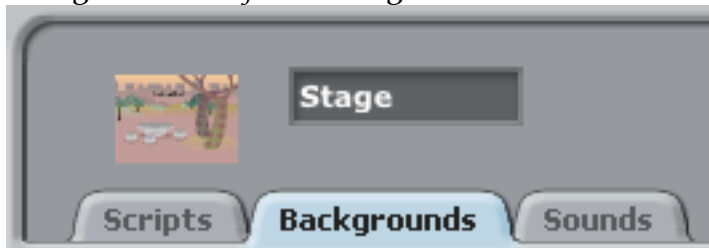


- 69) After the 'set Time to x' Block (where x is the amount of time the character has to find all the objects), we're going to set the condition that establishes how frequently the Time variable decrements until it stops. To handle more than one condition, the OR Logical Operator is used to hold the condition that needs to be met for the 'time' variable OR the 'score' variable. Have the students add the following Blocks:

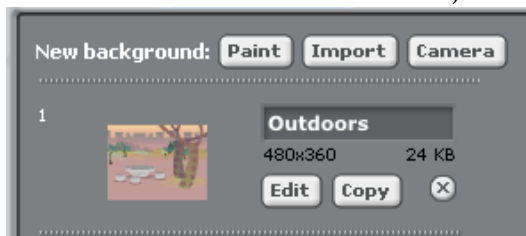


- 70) **Classroom Activity:** Have the students play their game and think about the effect the amount of time has on the ability to collect all the objects before time runs out. Discuss the effect changing the value of the Time variable has on game difficulty.

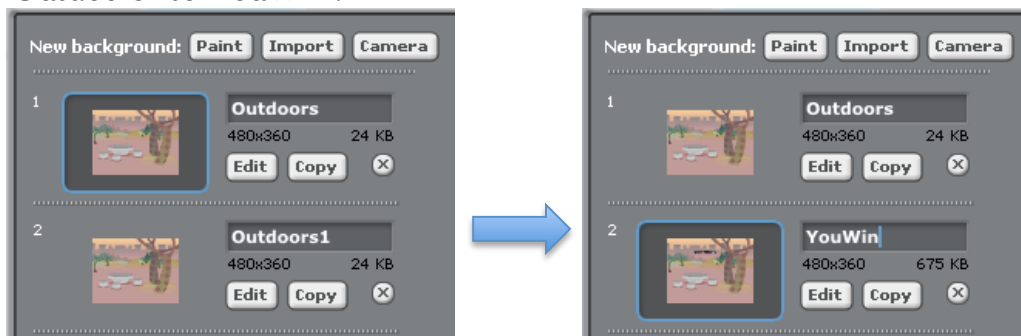
- 71) When the game ends we want to swap the background image with an image that either shows the words "You Win!!!" or "You Lose." To start, have the students go to the Backgrounds tab for the Stage.



- 72) Next to the 'Outdoors' Costume, have the students click the 'Copy' button.



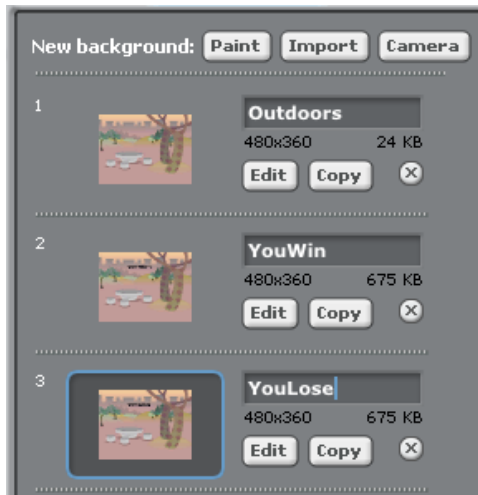
- 73) This will create the second Costume that will become the Background that will appear when the user wins the game! Have the students change the name of the second Costume from 'Outdoors1' to 'YouWin'.



- 74) Have the students edit the second Costume by clicking on the 'Edit' button. In the Paint Editor window, have the students click on the Text tool, click on the Canvas, and type the words You Win!!! in a location where the text is visible. Once the text has been entered, have the students click the 'OK' button to save the changes.



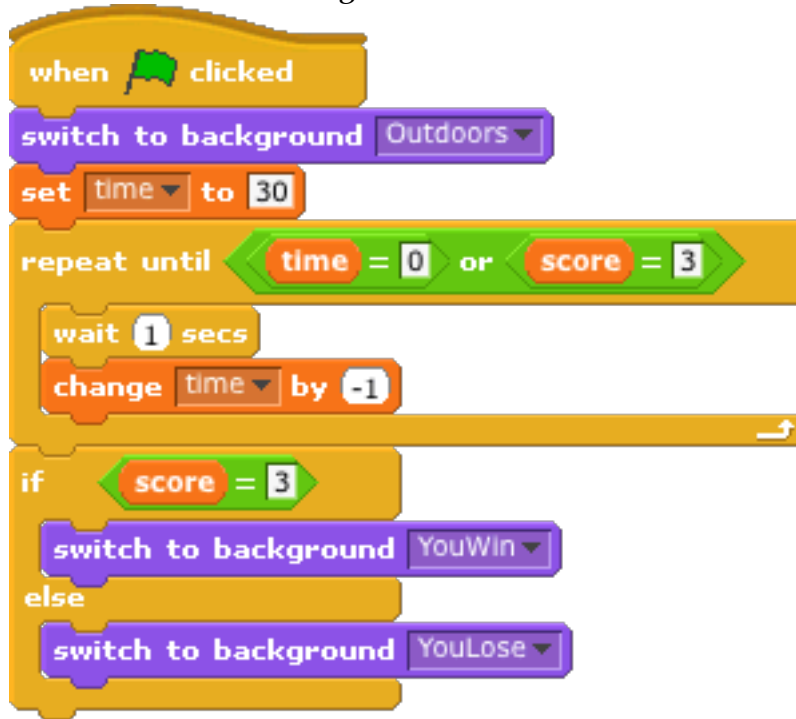
- 75) Next we want to repeat steps PAVG CLC steps 72, 73, & 74 to create two more Background Costumes. This time, have the students click on the 'Copy' button next to the second Costume, change the text label for the third Costume from 'YouWin1' to 'YouLose', and then have them click on the 'Edit' button to modify the text in the Background to say 'You Lose'.



- 76) Now that the second and third Costumes have been created for the Stage, have the students click on the Scripts tab for the Stage and add the following Blocks to the end of the 'repeat until ...' Block:



The Stack within the Stage should look like this:



- 77) Have the students save their projects as FirstInitial LastName PAVG Day 6 after they have completed the proper saving instructions (see Scratch Project Save Sheet for detailed info).
- Reflection Prompts
 - What does the 'or' Block do in your project?
 - What feature would be cool or interesting to add to your project?
 - How would you improve your own project?
 - Project Code: PAVG
 - Day Number: Day Six

Puzzle Adventure Video Game Completed